

INTRAOCULAR PRESSURE IS NOT THE WHOLE STORY: WHY GLAUCOMA OUTCOMES MUST BE REDEFINED



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Intraocular pressure (IOP) is the only modifiable risk factor in glaucoma, and its reduction continues to dominate both clinical decision-making and outcome assessment. This focus is understandable and has historical justification. However, the continued tendency to equate glaucoma control with numerical pressure targets alone reflects an increasingly outdated view of a complex and lifelong neurodegenerative disease. **IOP is indispensable, but it is not the disease, nor is it the outcome that patients ultimately care about.**

Glaucoma management is not a short-term exercise in achieving the lowest possible pressure **but a long-term commitment to preserving visual function, maintaining structural stability,** and sustaining treatment strategies that patients can realistically follow for decades. When success is narrowly defined by pressure values, clinically meaningful dimensions of care are overlooked.

From the perspective of clinicians working in high-volume tertiary glaucoma centers, it is evident that **pressure-centric thinking frequently fails to predict real-world outcomes.** Patients with “acceptable” IOPs continue to progress, while others remain stable with pressures that are traditionally considered suboptimal. This disconnect raises a critical question: **Are we measuring what truly matters?**

Minimally invasive glaucoma surgery (MIGS), particularly **trabecular microbypass technologies, has revealed the limitations of conventional outcome frameworks.** Initially dismissed as offering modest pressure reductions, these procedures have accumulated long-term data that challenged the assumption that greater pressure lowering is always synonymous with better long-term disease control.

Consistency Is a Clinical Outcome

One of the most underappreciated attributes of **trabecular microbypass surgery** is not the magnitude of IOP reduction but its **consistency.** Across multiple long-term studies, **sustained reductions in IOP, typically 20–40%,** have been demonstrated over follow-up periods of up to **5, 7, and even 8 years.**¹⁻⁴ More importantly, a large proportion of treated eyes **maintain pressure within target ranges** without the volatility often observed with medical therapy alone.

This effect is not confined to idealized trial populations. Meaningful and durable outcomes have been reported across a broad spectrum of glaucoma subtypes, including primary open-angle, pseudoexfoliative, pigmentary, and selected secondary glaucoma.

Such consistency suggests that **restoring physiological outflow through Schlemm’s canal addresses a fundamental**

pathophysiological bottleneck rather than a narrow diagnostic category.

In daily clinical practice, **reliability is often more valuable than dramatic but unpredictable reductions in pressure.** However, this distinction is rarely reflected in the definition of treatment success.

Freeing MIGS From Cataract Surgery

Another enduring misconception is that the trabecular microbypass primarily derives its benefits from concurrent cataract surgery. While phacoemulsification alone modestly lowers IOP, long-term observational data clearly demonstrate that **trabecular microbypass provides a significantly additive and durable benefit beyond lens extraction. Comparable outcomes** have also been achieved when the procedure is performed **as a standalone intervention in both phakic and pseudophakic eyes.**^{1,2}

This independence from lens status has important clinical implications. This allows intervention to be guided by the glaucoma trajectory, risk of progression, and treatment tolerance, rather than by the timing of cataract development. In other words, **MIGS enables earlier and more strategic decision-making,** a concept that remains underutilized in current practice.

Similarly, the **baseline disease burden should no longer be viewed as a gatekeeper for surgical consideration.** Although eyes with higher preoperative pressures and medication loads achieve larger absolute reductions, a clinically meaningful benefit is consistently observed even in eyes starting with relatively low IOP or limited medical therapy. This challenges the reflexive escalation model, which reserves surgery for failure rather than using it proactively to prevent it.

Medication Burden Is Not a Secondary Outcome

Despite decades of evidence, the **clinical consequences of long-term topical therapies remain underestimated.** Poor adherence, ocular surface disease, fluctuating pressure control, and cumulative toxicity are not theoretical concerns; they are everyday realities in glaucoma clinics.⁵⁻⁸

Long before surgical strategies were reconsidered, real-world observational studies demonstrated that **persistence with first-line topical therapy declined rapidly,** even with effective agents, exposing a fundamental gap between pharmacologic efficacy and real-life disease control.⁹ This gap has not narrowed over the years. As treatment regimens become increasingly complex, this has become more apparent.

Against this backdrop, **the value of the trabecular microbypass becomes clearer.** Longitudinal data consistently show **substantial**

reductions in medication burden during the early and intermediate postoperative years, with a significant proportion of patients reducing therapy and **many remaining medication-free long term**.¹⁻³ Although medication use may increase again with disease progression, **the years gained with a lower treatment burden are not trivial**. These periods represent improved adherence, better ocular surface health, and delayed exposure to more invasive surgeries.

Our real-world experience comparing trabecular microbypass implantation with endocyclophotocoagulation as adjuncts to cataract surgery reinforces this principle: similar long-term pressure control can be achieved, but **trabecular microbypass more reliably facilitates sustained reduction in medication burden with a favorable safety profile**.¹⁰

Stability, Not Suppression

Perhaps the most consequential shift in the MIGS narrative is the growing signal of **disease stability**. Across several long-term series, visual fields and structural parameters, including the cup-to-disc ratio and retinal nerve fiber layer thickness, remain largely stable for up to 5 years, with only a small minority of eyes showing clinically significant progression at 7 years.²⁻⁴ When progression beyond this timeframe occurs, it mirrors the natural history of glaucoma rather than suggesting procedural failure.

These findings do not imply neuroprotection, nor do they suggest that MIGS replaces filtering surgery in patients with advanced disease. However, they directly **challenge the entrenched belief that only aggressive pressure lowering can meaningfully alter the disease course**. Stability, sustained over time, is the outcome that truly matters, and it is precisely this outcome that remains underemphasized in many treatment algorithms.

Redefining Success in Glaucoma Care

If success in glaucoma continues to be defined solely by the achievement of the lowest possible IOP, we risk prioritizing intensity over sustainability. Treatments that deliver moderate but consistent pressure reduction, minimize medication burden, preserve ocular anatomy, and maintain long-term stability may ultimately **offer greater lifetime value than strategies focused exclusively on maximal pressure suppression**.

Long-term data remind us that glaucoma progression is rarely eliminated, regardless of the chosen intervention. The more relevant clinical question is whether **progression can be delayed safely and predictably with minimal cumulative cost to the patient**. When viewed through this lens, trabecular microbypass technologies do not represent a compromise but a recalibration of priorities.

IOP will always matter in glaucoma. However, until we broaden our **definition of success to include stability, sustainability, and patient-centered outcomes**, we will continue to measure the disease with tools that are necessary yet fundamentally incomplete. ■

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